2-03 ROADWAY EXCAVATION AND EMBANKMENT

2-03.1 Description

The Work described in this section, regardless of the nature or type of the materials encountered, includes excavating and grading the Roadway, excavating in borrow pits, excavating below grade, excavating channels, removing slide material, and disposing of all excavated material. These activities may be performed in making cuts, embankments, slopes, Roadway ditches, approaches, parking areas, Highway-driveway intersections, and in completing related Work.

The Work excludes these items if they are designated as pay items in the Contract:

1. Haul.
2. Excavation for Structures and ditches.
3. Removal of unsuitable materials.

The Plans may divide the project into separate areas (Roadway Excavation, Area A, Roadway Excavation, Area B, etc.). Such division does not imply any classification of materials in the areas. The boundaries of the areas shall not be changed regardless of how similar or dissimilar the materials are from one area to another.

All Work described here must reasonably conform to the alignment, grade, and cross-sections shown in the Plans or established by the Engineer.

2-03.2 Vacant

2-03.3 Construction Requirements

2-03.3(1) Widening of Cuts

If routine cuts do not supply enough material to form the embankment, the Contractor shall obtain more fill from cuts inside or outside the Right of Way as the Engineer may direct or from widening one or both sides of existing cuts as designated by the Engineer. In either case, the Contractor shall dress the sides of the cuts to any slopes the Engineer may require. If the Contractor has dressed a cut before the Engineer orders it widened, the Contracting Agency will pay for the resloping as provided in Section 1-04.4.

2-03.3(2) Rock Cuts

1. **Preserving Rock Below Subgrade**. The Contractor shall take care not to break down, loosen, or damage the rock under the Subgrade line, except as provided by Section 2-03.3(3). Normally cuts will be made from the top, lift by lift, to protect the rock bench that will remain. The Contractor shall be responsible for methods used and for any damage caused to the Roadbed, regardless of any previous approvals by the Engineer.
2. **Scaling and Dressing**. To leave rock cuts in a safe, stable condition, the Contractor shall scale and dress them, removing all loose fragments and rocks not firmly fastened to the rock slope. The Contractor shall also remove any overhanging rock the Engineer sees as a hazard to Roadway users.

   If the Engineer requires it, the Contractor shall remove loose fragments and rocks lying outside the slope stakes. Payment for such extra Work shall be by force account as provided in Section 1-09.6. The Contracting Agency will pay for loading and hauling these materials at the unit Contract prices that apply or as provided in Section 1-04.4.

3. **Drilling and Blasting**. Not less than two weeks prior to commencing drilling and blasting operations or at any time the Contractor proposes to change the drilling and blasting methods, the Contractor shall submit a blasting plan to the Engineer for review. The blasting plan shall contain the full details of the drilling and blasting patterns and controls the Contractor proposes to use for both the controlled and production blasting. The blasting plan submittal is required for all blasting operations and shall contain at least the following information:

   a) Station limits of proposed shot.

   b) Plan and section views of proposed drill pattern including free face, burden, blast hole spacing, blast hole diameter, blast hole angles, lift height, and subdrill depth.

   c) Loading diagram showing type and amount of explosives, primers, initiators, and location and depth of stemming.

   d) Initiation sequence of blast holes including delay times and delay system.

   e) Manufacturer's data sheets for all explosives, primers, and initiators to be employed.

   Review of the blasting plan by the Engineer shall not relieve the Contractor of the responsibility for the accuracy and adequacy of the plan when implemented in the field.

   When blasting to establish slopes 0.5:1 or steeper, and more than 10-feet high, the Contractor shall use controlled blasting. The Engineer may require the Contractor to use controlled blasting to form the faces of other slopes, even if the slopes could be formed by nonblasting methods.

   Controlled blasting refers to the controlled use of explosives and blasting accessories in carefully spaced and aligned drill holes to provide a free surface or shear plane in the rock along the specified backslope. Controlled blasting techniques covered by this Specification include presplitting and cushion blasting.

   In addition to the blasting plan submittal, when using controlled blasting the Contractor shall:

   a) Prior to commencing full-scale blasting operations, the Contractor shall demonstrate the adequacy of the proposed blast plan by drilling, blasting, and excavating short test sections, up to 100-feet in length, to determine which combination of method, hole spacing, and charge works best. When field conditions warrant, the Contractor may be ordered to use test section lengths less than 100-feet.

      Unless otherwise approved by the Engineer, the Contractor shall begin the tests with the controlled blast holes spaced 30-inches apart, then adjust if needed, until the Engineer approves the spacing to be used for full-scale blasting operations.

   b) The Contractor shall completely remove all overburden, soil, and loose or decomposed rock along the top of the excavation for a distance of at least 30-feet beyond the end of the production hole drilling limits, or to the end of the cut, before drilling the presplitting holes.

c) The controlled blast holes shall be not less than 2½-inches nor more than 3-inches in diameter.

d) The Contractor shall control drilling operations by the use of the proper equipment and technique to ensure that no hole deviates from the plane of the planned slope by more than 9-inches either parallel or normal to the slope. Drill holes exceeding these limits will not be paid for unless satisfactory slopes are being obtained.

e) Controlled blast holes shall extend a minimum of 30-feet beyond the limits of the production holes to be detonated, or to the end of the cut as applicable.

f) The length of controlled blast holes for any individual lift shall not exceed 20-feet unless the Contractor can demonstrate to the Engineer the ability to stay within the above tolerances and produce a uniform slope. If greater than 5-percent of the presplit holes are misaligned in any one lift, the Contractor shall reduce the height of the lifts until the 9-inch alignment tolerance is met. Upon satisfactory demonstration, the length of holes may be increased to a maximum of 60-feet with written approval of the Engineer.

g) When the cut height requires more than one lift, a maximum 2-foot offset between lifts will be permitted to allow for drill equipment clearances. The Contractor shall begin the controlled blast hole drilling at a point that will allow for necessary offsets and shall adjust, at the start of lower lifts, to compensate for any drift that may have occurred in the upper lifts.

h) Before placing charges, the Contractor shall determine that the hole is free of obstructions for its entire depth. All necessary precautions shall be exercised so that the placing of the charges will not cause caving of material from the walls of the holes.

i) The maximum diameter of explosives used in presplit holes shall not be greater than ½ the diameter of the presplit hole.

j) Only standard explosives manufactured especially for controlled blasting shall be used in controlled blast holes, unless otherwise approved by the Engineer. Bulk ammonium nitrate and fuel oil (ANFO) shall not be allowed to be loaded in the presplit holes.

k) If fractional portions of standard explosive cartridges are used, they shall be firmly affixed to the detonating cord in a manner that the cartridges will not slip down the detonating cord nor bridge across the hole. Spacing of fractional cartridges along the length of the detonating cord shall not exceed 30-inches center to center and shall be adjusted to give the desired results.

l) Continuous column cartridge type of explosives used with detonating cord shall be assembled and affixed to the detonating cord in accordance with the explosive manufacturer's instructions, a copy of which shall be furnished to the Engineer.

m) The bottom charge of a presplit hole may be larger than the line charges but shall not be large enough to cause overbreak. The top charge of the presplitting hole shall be placed far enough below the collar, and reduced sufficiently, to avoid overbreaking and heaving.

n) The upper portion of all presplit holes, from the top most charge to the hole collar, shall be stemmed. Stemming materials shall be sand or other dry angular material, all of which passes a ⅜-inch sieve.

o) If presplitting is specified, the detonation of these holes shall be fired first.

p) If cushion blasting is specified, the detonation of these holes shall be fired last on an instantaneous delay after all other blasting has taken place in the excavation.

q) Production blast holes shall not be drilled closer than 6-feet to the controlled blast line, unless approved by the Engineer. The bottom of the production holes shall not be lower than the bottom of the controlled blast holes. Production holes shall not exceed 6-inches in diameter, unless approved by the Engineer. Detonation of production holes shall be on a delay sequence toward a free face.

r) The use of horizontal blast holes for either production or controlled blasting is prohibited.

2-03.3(3) Excavation Below Grade

Rock Excavation. When the Contractor finds rock or other hard material at the Subgrade elevation, it shall be excavated the full width of the Roadbed to at least 6-inches below Subgrade, then backfilled with rock fragments, gravel, or other free-draining material not more than 4-inches in diameter.

If the Contractor uses a Subgrade trimmer, the backfill shall be rock, gravel, or other free-draining material not more than 2-inches in diameter. The Contractor shall save the finer free-draining material from excavations or borrow pits to use in backfilling the top 6-inches of the Subgrade. All such material shall be approved by the Engineer.

Sub excavation. At any time, the Engineer may order excavation below Subgrade to remove soft and uncompactible material. The replacement material shall be free-draining and granular, or other materials as determined by the Engineer.

Draining Rock Pockets. If blasting below Subgrade leaves a rock pocket that will not drain, the Contractor shall dig a trench from the pocket bottom to the roadside ditch, then backfill both the pocket and the trench with rock fragments, gravel, or other material approved by the Engineer, at no expense to the Contracting Agency.

Compaction. If the density of the natural earth under any area of the Roadway is less than that required in Section 2-03.3(14)C, Method B, the Engineer may direct the Contractor to:

1. Scarify the earth to a depth of 6-inches.
2. Aerate or water.
3. Compact the scarified area to the required density.
4. Excavate to a specific depth.
5. Backfill the excavated area in layers, using the previously excavated material or other material.
6. Compact each layer to meet the compaction requirements for embankments.

2-03.3(4) Sluicing

The Contractor shall not excavate by sluicing unless the Special Provisions specifically call for it.

2-03.3(5) Slope Treatment

The tops of all Roadway cut slopes, except solid rock cuts, shall be rounded in accordance with the Standard Plan. Unless otherwise noted in the Plans or Special Provisions, Class A slope treatment shall be utilized.

If a layer of earth covers a rock cut, the slope shall be rounded above the rock as if it were an earth slope.

When the Contractor removes stumps or any embedded material from the rounded area, the void shall be backfilled and stabilized to prevent erosion.

All Work required to complete slope treatment, including excavation, haul, and slope rounding, shall be included in the unit Bid price for Roadway excavation.

2-03.3(6) Deposit of Rock for the Contracting Agency's Use

At the Engineer's direction, the Contractor shall deposit excavated rock at the roadside or elsewhere. If this requires the Contractor to use material that would otherwise have gone into an embankment, the Contracting Agency will pay for the extra cubic yards of excavation needed to complete the embankment. Any such rock deposit shall be Contracting Agency property. The Contractor shall be responsible for safekeeping the deposit until the Contracting Agency has removed it or until the Contract is completed.

2-03.3(7) Disposal of Surplus Material

2-03.3(7)A General

The Contractor shall haul all excavation to the nearest embankment unless the Engineer declares the hauling distance to be too great. If excavation yields more material than needed for nearby embankments, the Contractor shall dispose of the excess in keeping with the Special Provisions or as the Engineer directs.

2-03.3(7)B Haul

When the Contract includes a payment item for haul, the Contracting Agency will pay as follows for hauling excess excavation to a disposal site:

1. If the Contracting Agency provides a site, but the Contractor chooses to haul elsewhere, the Contracting Agency will pay for the actual distance up to but not exceeding the distance that would have been necessary using the Contracting Agency site.
2. If the Contracting Agency does not provide a site, the Contracting Agency will pay for the actual distance up to but not exceeding the distance necessary to haul to a site 1 mile from the project limits.

2-03.3(7)C Contractor-Provided Disposal Site

If the Contracting Agency provides no waste site, but requires disposal of excess excavation or other materials, the Contractor shall arrange for disposal at no expense to the Contracting Agency, except as provided in Section 2-03.3(7)B, Item 2.

The Contractor shall acquire all permits and approvals required for the use of the disposal site. The cost of any such permits and approvals shall be included in the Bid prices for other Work.

The Contractor shall provide the Engineer the location of all disposal sites to be used and also provide copies of the permits and approvals for such disposal sites before any waste is hauled off the project.

Disposal of excess material within a wetland area will not be allowed without a Section 404 permit issued by the U.S. Corps of Engineers and approval by the local agency with jurisdiction over the wetlands. Wetlands are defined as those areas inundated or saturated by ground or surface water at a frequency and duration sufficient to support, and that under normal circumstance do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

The Contractor shall protect, indemnify, and save harmless the Contracting Agency from any damages that may arise from the Contractor's activities in making these arrangements. Such indemnity shall be in accordance with RCW 4.24.115 as amended by CH. 305, Laws of 1986. Any action required to satisfy any permit and/or any approval requirements in a Contractor provided disposal site shall be performed by the Contractor at no additional expense to the Contracting Agency.

Reclamation of a Contractor-supplied waste site must conform to the requirements of Section 3-03.

2-03.3(8) Wasting Material

If, against the Engineer's orders, the Contractor wastes material needed for the embankment, it shall be replaced at no expense to the Contracting Agency with material the Engineer approves.

2-03.3(9) Roadway Ditches

At each transition from cut to fill, the Contractor shall divert any Roadway ditch away from the embankment in natural ground. Ditches shall never permit water to flow into or upon embankment material.

2-03.3(10) Selected Material

When the Contract or the Engineer calls for it, selected material shall be used for finishing the top part of the Subgrade, for structural or other backfill, or for other purposes. Unless the Special Provisions specify otherwise, the Engineer may identify as "selected" any material excavated within the right-of-way, including the excavation of local borrow.

Direct Hauling. If it is practical, the Contractor shall haul selected material immediately from excavation to its final place on the Roadbed. The Contracting Agency will pay for such Work at the unit Contract prices for excavating, hauling, watering, and compacting.

Delayed Excavation. If it is impractical to haul selected material to its final place at once, the Contractor shall delay excavation until the placement will be workable. The Contracting Agency will not pay extra for delayed excavation.

Stockpiling. The Engineer may allow the Contractor to stockpile selected materials if delaying the excavation will hamper grading or force impractical movements of equipment. In this case, the Engineer will direct where and when the Contractor shall excavate, stockpile, haul, and place the selected materials.

Sections 2-03.4 and 2-03.5 describe how the Contracting Agency will measure and pay for excavating and hauling these stockpiled selected materials. The neat line volume of material removed will provide the basis for measuring material taken from the stockpile.

2-03.3(11) Slides

If a slide occurs on a finished slope before final acceptance of the Work, the Contractor shall remove or replace the slide material. The Contractor shall also refinish the slope to the condition and with the materials required by the Engineer.

The Contracting Agency will pay for the excavation at the unit Contract price and for resloping on a force account basis. The Engineer may authorize payment for the excavation by agreed price or force account if:

1. The slide material cannot be measured accurately; or
2. Excavation of slide material requires equipment not available on the project.

If the Contractor undercuts or destroys a slope, or has failed to implement erosion control devices as shown in the Contract or in the TESC plan, it shall be resloped to the original alignment or to a new one established by the Engineer at no expense to the Contracting Agency.

2-03.3(12) Overbreak

Overbreak includes that part of any material excavated, displaced, or loosened outside the staked or reestablished slope or grade. Such material is considered overbreak whether its movement resulted from blasting, from the character of the material itself, or from any other cause. Overbreak, however, does not include material from slides as described in Section 2-03.3(11).

If the Engineer does not approve use of the overbreak, the Contractor shall remove, haul, and dispose of it at no expense to the Contracting Agency. In this case, the Contractor shall follow the procedure for handling surplus described in Section 2-03.3(7).

If the Engineer approves, the Contractor may use overbreak:

1. To complete an embankment when the excavated material unexpectedly falls short of the amount required. The Contracting Agency will pay the Roadway excavation Contract price for the volume of material the overbreak replaces, and will pay the Contract price for haul. However, no payment will be made if overbreak is used when other material is available within the neat lines of the Roadway prism.
2. To replace borrow excavation originally planned for an embankment. The Contracting Agency will pay for overbreak used this way at the unit Contract price for Roadway or borrow excavation, whichever costs less. The Engineer will include haul to be paid as in the original Proposal in comparing the costs under the two payment methods.

2-03.3(13) Borrow

Borrow is the excavation of material outside the Roadway prism or outside the limits of any other excavation area required by the Contract. Before any borrow site can be used, it must be measured and approved by the Engineer. Any material excavated from a borrow site before the site is measured will not be paid for. The widening of Roadway cuts and ditches will be considered Roadway excavation, not borrow.

If the Contract documents designate borrow sources, the Contractor may utilize those sources or may obtain borrow from other sites. If borrow is obtained from a Contractor-provided site, there will be no additional cost to the Contracting Agency beyond the Contract unit price for the excavated borrow material. There will be no payment for aeration of the borrowed material from a Contractor-provided site, even if the Contract contains an item for aeration and even if the Contract documents designate borrow sources.

If neither the Plans nor the Special Provisions name a source for borrow, the Contractor shall provide a source at no expense to the Contracting Agency.

The Contractor shall reclaim all borrow sites, Contracting Agency-owned, Contracting Agency-supplied, or obtained by the Contractor, in keeping with Section 3-03.

2-03.3(14) Embankment Construction

The Contracting Agency classifies embankment construction as:

1. Rock embankment — in which the material in all or any part of an embankment contains 25-percent or more, by volume, gravel or stone 4-inches or more in diameter. Section 2-03.3(14)A.
2. Earth embankment — made of any material other than that used in rock embankment. Section 2-03.3(14)B.

Unstable Base. If the Engineer believes the natural earth base will impair an embankment or make it unstable, the Contractor shall stabilize or remove and dispose of the base material in keeping with this section or Section 2-03.3(14)E.

Hillside Terraces. Unless the Engineer directs otherwise, the Contractor shall terrace the original ground or embankment on hillsides, on the sides of existing embankments, and in transitions from cuts to fills. Each terrace shall penetrate the slope at least 5-feet and shall not be more than 5-feet high. The horizontal face of the terrace shall slope outward at approximately 0.05-foot per foot. The Engineer may order the Contractor to place gravel backfill, pipe drains or both to drain any seepage.

All costs for building terraces shall be included in the prices for other Work.

Soft Base. On wet or swampy ground, the Contractor shall haul and spread embankment material by methods that will disturb the base as little as possible. If the Engineer approves, the Contractor may place the lower part of the fill by dumping and spreading successive loads to form a uniform layer just thick enough to support equipment used to place and compact upper layers.

Normally the Contractor shall not increase the planned depth of the embankment over a soft base merely to permit the use of heavier equipment. But if the Contractor proves that the planned depth will not support light hauling vehicles, the Engineer may approve a deeper fill. The Contractor shall not claim extra pay if these restrictions require the use of lighter equipment or different construction methods than originally planned for use on the soft base.

2-03.3(14)A Rock Embankment Construction

The Contractor shall build rock embankments in horizontal layers. No layer shall be deeper than 18-inches unless the rocks in the fill material average more than 18-inches in diameter. The Contractor shall separate and distribute the larger pieces of rock and fill the spaces between them with smaller rocks and earth. With the Engineer's approval, the Contractor may dispose of rocks larger than the average size instead of placing them in the embankment.

Compacting. The Contractor shall use a 50-ton compression roller or a vibratory roller having a dynamic force of at least 40,000-pounds impact per vibration and at least 1,000 vibrations per minute. In either case, the roller shall make one full coverage for each 6-inches, or any fraction of 6-inches, of lift depth.

When lift depth is 18-inches or less, the Contractor may use a 10-ton compression roller or a vibratory roller having a dynamic force of at least 30,000-pounds impact per vibration and at least 1,000-vibrations per minute. In either case, the roller shall make four full coverages for each 6-inches, or any fraction of 6-inches, of lift depth.

Rollers must exert reasonably even pressure over the area covered. The Contractor shall limit the speed of compression rollers to no more than 4-miles per hour, and the speed of vibratory rollers to no more than 1.5-miles per hour.

If possible, the Contractor shall compact the material even further by routing empty and loaded hauling equipment evenly over the entire width of the embankment.

When the Engineer believes rolling to be physically impractical, rolling may be omitted on part or all of a layer.

Should excessive moisture threaten the stability of the embankment the Engineer may order the Contractor to alter the operation. This may include alternating layers of wet and dry materials, drying materials before placing, or halting Work in the problem areas. In this case the Contracting Agency will not increase payment, but will pay the unit Contract prices for the pay items that apply.

Top Layer. The Contractor shall build each rock embankment up to 6-inches below Subgrade. The top 6-inch layer of embankment shall be of rock, gravel, or other free-draining material that does not exceed 4-inches in diameter. When the Plans require use of a Subgrade trimmer, these materials in the top layer may not exceed 2-inches in diameter.

When practical, and as approved by the Engineer, the Contractor shall save the finer free-draining material from excavations or borrow pits for use in topping rock fills. If selected materials suitable for topping are available, the Contracting Agency will pay for them as described in Section 2-03.3(10). If such materials are not available on site, the Contracting Agency will pay for imported materials by including them in the unit Contract price for gravel borrow or borrow excavation, each including haul. If the Proposal does not include these items, the Contracting Agency will pay as provided in Section 1-04.4.

2-03.3(14)B Earth Embankment Construction

The Contractor shall place earth embankments in horizontal layers of uniform thickness. These layers shall run full width from the top to the bottom of the embankment. Slopes shall be compacted to the required density as part of embankment compaction.

During grading operations, the Contractor shall shape the surfaces of embankments and excavations to uniform cross-sections and eliminate all ruts and low places that could hold water. The Contractor shall raise the center of an embankment above the sides. When the surface of an embankment intersects a side hill, the surface shall be sloped away at a rate not to exceed 20:1.

2-03.3(14)C Compacting Earth Embankments

This section describes three methods (A, B, and C) for building earth embankments. The Contractor shall use Method B unless the Special Provisions require another method.

Method A. Each embankment shall be made of layers no more than 2-feet thick. The Contractor shall compact each layer by routing loaded haul equipment over its entire width. If the Engineer approves, the Contractor may use end dumping to begin placing a side hill fill too narrow for hauling equipment. When the fill is wide enough, the remaining layers shall be compacted by the loaded hauling equipment.

Method B. The top 2-feet of each embankment shall be compacted to 95-percent of the maximum density as determined by the compaction control tests described in Section 2-03.3(14)D. All material below the 2-foot level shall be compacted to 90-percent of the same maximum density.

In the top 2-feet, horizontal layers shall not exceed 4-inches in depth before compaction. No layer below the top 2-feet shall exceed 8-inches in depth before compaction.

The Contractor shall use compacting equipment approved by the Engineer.

Method C. Each layer of the entire embankment shall be compacted to 95-percent of the maximum density as determined by the compaction control tests described in Section 2-03.3(14)D.

In the top 2-feet, horizontal layers shall not exceed 4-inches in depth before compaction. No layer below the top 2-feet shall exceed 8-inches in depth before compaction.

The Contractor shall use compacting equipment approved by the Engineer.

Under Methods B or C, the Engineer may permit the Contractor to increase layer thickness up to 18-inches before compaction, provided:

1. The layer is more than 2-feet below the top of the embankment,
2. An approved vibratory roller is used, and
3. The required density is obtained throughout the full depth and width of each layer.

Whatever the method used, any embankment inaccessible to large compacting equipment shall be compacted with small mechanical or vibratory compactors.

Moisture Content. Within the limits described below, the Contractor shall adjust moisture content during compaction to produce a firm, stable embankment. The Contractor shall not begin compaction until the moisture content is so adjusted.

Under Method B, the moisture content of the material shall not exceed 3-percent above the optimum determined by the tests described in Section 2-03.3(14)D. If the material contains too little moisture to compact properly, the Engineer may order the Contractor to water the material in specific amounts. In this case, the Contracting Agency will pay the unit Contract price for water (Section 2-07).

Under Method C, the moisture content shall not vary more than 3-percent above or below optimum determined by the tests described in Section 2-03.3(14)D.

The Engineer may permit the Contractor to place materials having a higher moisture content than specified in this section if:

1. The material consists of free-draining rock, gravel, or sand that produces a firm, stable embankment; and
2. The excess moisture will not impair the embankment.

However, the Engineer may at any time require the Contractor to return to normal moisture-content Specifications.

The Contracting Agency will consider all costs of drying embankment material to be incidental to other Work. If, however, the Contract includes an aeration item, the Contracting Agency will pay for such Work as specified in Sections 2-03.4 and 2-03.5.

If weather prevents drying excavation or borrow materials to the required moisture content, the Engineer may order the Contractor to alter normal procedures or equipment to prevent damage to the partial or complete embankment. In this case, the Contracting Agency will not increase payment, but will pay the unit Contract prices for the pay items that apply.

The Contractor shall repair at no expense to the Contracting Agency any partial or complete embankment that loses stability because of continued hauling across it. Evidence of lost stability shall include pumping or rutting. The Contractor shall also alter hauling equipment or procedures to prevent further damage.

If it appears that rain or snow will soak an area that has been aerated, the Contractor shall temporarily seal it against the weather. Should the Contractor fail to do so, any additional aeration required to restore the area to its previous condition shall be done at no expense to the Contracting Agency.

2-03.3(14)D Compaction and Moisture Control Tests

Maximum density and optimum moisture content shall be determined by one of the following methods:

1. Materials with less than 30-percent by weight retained on the U.S. No. 4 sieve shall be determined using FOP for AASHTO T 99 Method A.
2. Materials with 30-percent or more by weight retained on the U.S. No. 4 sieve and less than 30-percent retained on the ¾-inch sieve shall be determined by WSDOT Test Method No. 606 or FOP for AASHTO T 180 Method D. The determination of which test procedure to use will be made solely by the Contracting Agency.
3. Materials with 30-percent or more retained on the ¾-inch sieve shall be determined by WSDOT Test Method No. 606.

In place density will be determined using Test Methods WSDOT FOP for AASHTO T 310 and WSDOT SOP for T 615.

2-03.3(14)E Unsuitable Foundation Excavation

When the Contract or the Engineer requires it, the Contractor shall excavate unstable natural ground before building any embankment over it. This unstable material may include peat, muck, swampland, buried logs and stumps, or other material not fit for an embankment base. The Contractor shall excavate such material to the boundaries set by the Engineer.

The Work will not be considered unsuitable foundation excavation if the materials:

1. Came from the Roadway cut, ditch, or channel-change prisms.
2. Resulted from Structure excavation Class A or B.
3. Are covered in Section 2-03.3(3).

If the Contract provides no Bid item for unsuitable foundation excavation, the Contracting Agency will pay as provided in Section 1-04.4.

2-03.3(14)F Displacement of Unsuitable Foundation Materials

If the Contract requires it, the Contractor shall displace or remove any overburden of peat, muck, or other unstable material to permit placing the embankment on underlying firm ground. The Engineer will determine the elevation at which the ground is firm enough to support the embankment.

To displace such material, the Contractor shall use explosives or any other method the Engineer requires. If this Work upheaves overburden material outside the slopes of the new fill, the Contractor shall level the material to make it presentable.

The Contracting Agency will pay for the Work described in this section by force account. Any other costs related to the Work shall be incidental to building the embankment and shall be included in the unit Contract prices for the Work items that apply.

2-03.3(14)G Backfilling

When water fills an area after the removal of soft or unstable materials, the Contractor shall, if possible, drain the site so that any backfill may be compacted. If drainage is not possible, the Contractor shall use granular material for backfilling in water, including areas where blasting has displaced the soft material. The Special Provisions may require other backfilling methods.

The costs of pumping or digging temporary drainage ditches shall be incidental to and included in other items of Work that apply.

2-03.3(14)H Prefabricated Vertical Drains

The Contractor shall furnish all necessary labor, equipment and materials, and perform all operations necessary for the installation of prefabricated vertical drains in accordance with the details shown in the Plans and with the requirements of these Specifications.

The prefabricated drain shall consist of a continuous plastic drainage core wrapped in a nonwoven geotextile material as specified in the Contract.

The drains shall be free of defects, rips, holes, or flaws. During shipment and storage, the drain shall be wrapped in a heavy-duty protective covering. The storage area shall protect the drain material from sunlight, mud, dirt, dust, debris, and detrimental substances. Manufacturer certification shall be provided for all drain materials delivered to the project.

Vertical drains shall be staked by the Contractor and constructed prior to embankment construction.

Prior to installation of vertical drains, a sand drainage blanket shall be placed on the ground surface for use as a working platform. This platform shall have a minimum depth of 2-feet and shall consist of uncompacted material meeting the requirements of Section 9-03.13(1).

Vertical drains shall be installed with equipment that will cause a minimum of subsoil disturbance. A mandrel or sleeve shall be advanced through the subsoil using vibratory, constant load, or constant rate of advance methods. The mandrel shall have a maximum cross-sectional area of 14-square inches, shall protect the prefabricated drain material from tears, cuts, and abrasions during installation, and shall be provided with an "anchor" plate or rod. The "anchor" plate or rod shall provide sufficient strength to prevent the soil from entering the bottom during installation and shall anchor the bottom of the drain at the required depth when the mandrel is removed. Use of falling weight impact hammers or jetting will not be allowed within the compressible subsoil to be drained.

The prefabricated drains shall be installed vertically from the working surface to the required elevations and in a sequence that will not require equipment to travel over previously installed drains. The Contractor shall provide the Engineer with a suitable means of verifying the plumbness of the equipment and determining the depth of the drain at any time. The equipment shall not deviate more than 0.25-inches per foot from vertical.

Splices or connections in the prefabricated drain material shall be done in a professional manner to ensure continuity of the wick material. The prefabricated drain shall be cut to leave at least 6-inches protruding above the working platform at each drain location.

Where obstructions are encountered which cannot be penetrated the Contractor shall abandon the hole. A maximum of two attempts shall be made to install a new drain within 18-inches of the obstructed hole. Drains that otherwise deviate from the Plan location by more than 6-inches, or that are damaged or improperly installed, will be rejected.

Installation of the drains should consider and be coordinated with the geotechnical instrumentation shown in the Plans. Special care shall be taken when installing drains near instrumentation already in place. Replacement of instrumentation damaged by the Contractor will be the responsibility of the Contractor.

The Contractor shall demonstrate that the equipment, method, and materials produce a satisfactory installation in accordance with these Specifications. For this purpose, the Contractor shall be required to install trial drains at different locations within the Work area.

At least two weeks prior to the installation of the drainage wicks, the Contractor shall submit to the Engineer, for review and approval, details of the sequence and method of installation. The submittal shall, at a minimum, contain the dimensions and length of mandrel, a detailed description of the proposed method(s) for overcoming obstructions, and the proposed method(s) for splicing drains.

Approval by the Engineer will not relieve the Contractor of the responsibility to install prefabricated vertical drains in accordance with the Plans, Special Provisions, and these Specifications. If, at any time, the Engineer considers the method of installation does not produce a satisfactory drain, the Contractor shall alter the method and equipment as necessary.

2-03.3(14)I Embankments at Bridge and Trestle Ends

This Work consists of filling around the ends of trestles and bridges, the area defined in Section 1-01.3. The Contractor shall begin and complete this Work as soon as possible after each bridge is completed or when the Engineer requires.

The Contractor shall select fill material from the excavation sources elsewhere on the project. Bridge Approach Embankments shall be compacted to at least 95-percent of the maximum density as determined by the tests described in Section 2-03.3(14)D. In any embankment area where piles will be installed, the Contractor shall remove all solid material, rocks, broken concrete, etc., larger than 3-inches across that would interfere with pile driving.

To prevent the bridge from being distorted or displaced, the Contractor shall place backfill evenly around all sides and parts of the Structure. The Contractor shall not backfill any abutment prior to placing the Superstructure. After the Superstructure is in place, use of small compactors may be required to compact the backfill around the Structure. Embankments and backfill behind the abutments must be brought up in layers and compacted concurrently. The difference in backfill height against each abutment shall not exceed 2-feet unless approved by the Engineer.

The Contractor may request, in writing, approval to place the abutment backfill (either full or partial height) prior to placement of the Superstructure. To receive this approval, the Contractor shall submit calculations for the Engineer's review. The calculations shall prove that the abutment is stable, both for overturning and sliding, without the Superstructure in place. The stability calculations shall assume a loading of 30-lbs/ft^3 equivalent fluid pressure and include at least a 2-foot surcharge for the backfill placement equipment. If the abutment backfill is allowed to be placed prior to completion of the Superstructure, the Contractor shall bear any added cost that results from the change.

The Contractor shall build the embankment under the bridge to the dimensions shown in the Standard Plans or detailed in the Plans.

Cost related to all Work described in this section shall be incidental to other Work and included in the unit Contract prices that apply.

2-03.3(14)J Gravel Borrow Including Haul

When required by the Plans or the Engineer, the Contractor shall use gravel borrow meeting the requirements of Section 9-03.14(1) to:

1. Build structural embankments.
2. Backfill excavation of unsuitable foundation material above the ground water table.
3. Backfill below-grade excavation above the ground water table.
4. Construct mechanically stabilized earth walls.
5. Construct reinforced soil slopes.

Gravel borrow shall be compacted according to Section 2-03.3(14)C and 2-03.3(14)D.

2-03.3(14)K Select or Common Borrow Including Haul

When required by the Plans or the Engineer, the Contractor shall use select borrow meeting the requirements of Section 9-03.14(2), or common borrow meeting the requirements of Section 9-03.14(3) to:

1. Build embankments.
2. Backfill excavation of unsuitable foundation material above the ground water table.
3. Backfill below-grade excavation above the ground water table.

Where specified, select borrow may be used for constructing reinforced slopes.

Select borrow and common borrow shall be compacted according to Section 2-03.3(14)C and 2-03.3(14)D.

2-03.3(14)L Embankment Widening for Guardrail

Embankments widened for the installation of beam guardrail shall be terraced. Each terrace shall penetrate the slope 2-feet and shall not be more than 5-feet high. Compaction shall be in accordance with Method A, as specified in Section 2-03.3(14)C. Guardrail posts shall not be installed until the embankment widening is completed and compacted.

2-03.3(14)M Excavation of Channels

Excavation of channels includes all ditches 8 or more feet wide at the bottom.

Before excavating, the Contractor shall clear and grub the area in accordance with Section 2-01.

2-03.3(15) Aeration

The Contracting Agency may include aeration as a Contract item if material from test holes in excavation or borrow sites is too wet to compact properly. Even if the Contract includes such an item, the Contractor shall make every effort to reduce the need for aeration. The Contractor shall do so by using methods known to be effective in building embankments with wet materials. Such methods include open ditching to drain excavation areas or alternating layers of wet and dry materials. These and similar methods will be incidental to excavation and their costs shall be included in the unit Contract price for Roadway excavation, for borrow excavation (including haul), and for haul.

If aeration is not a Contract item, its cost shall be incidental to and included in the excavation and embankment items.

Aeration Equipment. The Engineer may direct the Contractor to use aeration equipment in these areas: Roadway excavation, borrow sites, or embankments. The Contracting Agency does not guarantee the moisture-reducing effectiveness of any single type of equipment. The Engineer may, however, require the use of any type that will best aerate a given area.

If the Contractor uses any of the following types of equipment, it shall meet these minimum requirements:

1. Heavy duty power grader. This machine shall have a moldboard measuring 12-feet long, 24-inches high, and ¾-inch thick. Each grader shall carry its maximum number of standard scarifier-rippers or discs.

2. Heavy duty gang plow. It shall have at least five 16-inch bottoms. Its tractor shall be able to move no less than 1½-miles per hour while plowing at least 9-inches deep through fairly wet material.
3. Heavy duty tandem discs. This machine shall cut a swath at least 8-feet wide with discs no less than 28-inches in diameter. Its tractor shall be able to turn fairly wet material at least 6-inches deep while moving at 2-miles per hour or more.
4. Heavy duty self-propelled, rotary pulverizer. This machine shall have paddles attached to a transverse shaft. It shall travel 1½-miles per hour or more while aerating a swath at least 6-feet wide to a depth of 6-inches.

The Contractor shall not use any aerating equipment listed above in tandem nor use any of this equipment to carry out other Bid items of Work while aerating.

The Engineer may halt aerating Work when weather conditions prevent satisfactory results.

2-03.3(16) End Slopes

The Engineer will determine when and where to build end slopes, whether these occur at the beginning or end of a project, at the borders of excavation or embankments, at bridge ends, or elsewhere. The Contractor shall build end slopes not detailed in the Plans to the line and grade designated by the Engineer regardless of centerline limits shown in the Plans. All Work to complete and maintain these end slopes shall be considered as Work to be performed under the Contract.

2-03.3(17) Snow Removal

If snow deep enough to interfere with the Work covers a cut or an embankment, the Contractor shall remove and deposit it outside the slope stakes. Snow removal must be done at least 100-feet ahead of excavation and embankment Work. The Contractor shall remove snow at no expense to the Contracting Agency.

2-03.3(18) Stepped Slope Construction

When the Plans or the Engineer requires it, the Contractor shall shape slopes cut in soft rock to a stepped pattern conforming closely to the typical cross-section in the Plans. Stepped slopes shall meet these requirements:

1. Each step shall be 1 to 2-feet high.
2. The horizontal depth of each step will depend on its relationship to the staked slope ratio. The approximate midpoint of each horizontal tread shall occur on the staked slope line.
3. The treads shall be approximately level in all directions.
4. The ends of the steps shall be blended into the natural ground, with loose material removed from transitional areas.
5. If the Contractor cannot rip a rock outcropping within a cut, the steps shall be blended into the rock.
6. Large rocks and material that may fall into the ditch line or onto the Roadway shall be removed, but scaling is not required.

The compaction and seeding requirements of Section 8-01.3(2) shall not apply to stepped slope construction.

The Contracting Agency will measure stepped slope excavation by the area defined by the staked slope line. The unit Contract price per cubic yard for Roadway or borrow excavation shall be full pay for all labor and equipment required to build stepped slopes.

2-03.4 Measurement

Roadway excavation, unsuitable foundation excavation, and common borrow items will be measured by the cubic yard. All excavated material will be measured in the position it occupied before the excavation was performed. An original ground measurement will be taken using cross-section or digital terrain modeling survey techniques. For Roadway excavation items, the original ground will be compared with the planned finished Roadway section shown in the Plans. Slope/ground intercept points defining the limits of the measurement will be as staked. For unsuitable foundation excavation and common borrow items, the original ground will be compared with a survey of the excavation area taken after the Work is completed. When the Contracting Agency requires excavated material to be stockpiled, re-excavated and moved again, a second measurement will be made, adding quantity for the same item used in the original excavation. The second measurement will be a comparison of the original cross-section of the stockpile with a cross-section of the stockpile area after the second excavation is completed.

If the excavation item does not include Haul, then the measurement provisions of Section 2-04 shall apply.

Gravel borrow and select borrow will be measured by the cubic yard or ton. Measurement by cubic yard will be made in the hauling vehicle.

Sand drainage blanket will be measured by the ton with deductions made for the weight of moisture above 8-percent.

Embankment compaction (Methods B and C in Section 2-03.3(14)C) will be measured by the cubic yard. An original ground measurement will be taken using cross-section or digital terrain modeling survey techniques. Quantities will be determined based on a comparison of the original ground measurement with the finished embankment section as staked. No allowance will be made for material that settles. No deduction will be taken for other items constructed within the embankment (bridge abutments, piers, columns, backfill, pipes, etc.). The Contracting Agency will exclude from compaction measurement material that is wasted or placed under water and not compacted in layers as provided by Sections 2-03.3(14)A and 2-03.3(14)C. In cuts, where excavation has been made below the planned Subgrade elevation, and in fills where excavation has been made below original ground, compaction will be measured by the cubic yard in the cross-section of compacted backfill material. When material below grade in cuts or in original ground beneath fills is scarified and recompacted, embankment compaction will be measured by its compacted depth, up to a maximum of 6-inches. There is no specific unit of measure and no measurement will be made for method A compaction as described in 2-03.3(14)C.

No specific unit of measure will apply to the force account item of “Aeration”.

Controlled blasting of rock face will be measured by the linear foot of hole drilled. Holes will be measured from the top of the rock surface to the elevation of the Roadway ditch or to a bench elevation set by the Engineer. Quantities shown in the Plans are based on 30-inch hole spacing. Actual quantities will depend on field conditions and results from test sections.

Prefabricated vertical drains will be measured by the linear foot. Trial drains will be measured and included in the payment quantity for the prefabricated vertical drains. The drains will be measured from the top of the working platform to the bottom of each hole.

2-03.5 Payment

Payment will be made in accordance with Section 1-04.1, for each of the following Bid items that are included in the Proposal:

"Roadway Excavation", per cubic yard.

"Roadway Excavation Incl. Haul", per cubic yard.

"Roadway Excavation – Area ____", per cubic yard.

"Roadway Excavation Incl. Haul – Area ____", per cubic yard.

The unit Contract price per cubic yard for "Roadway Excavation", "Roadway Excavation Incl. Haul", "Roadway Excavation – Area __" and "Roadway Excavation Incl. Haul – Area ___" shall be full compensation for all costs incurred for excavating, loading, placing, or otherwise disposing of the material. For "Haul", the unit Contract price as provided in Section 2-04 shall apply, except when the pay item is shown as including Haul. In that case the unit Contract price per cubic yard shall include "Haul."

When the Engineer orders excavation below Subgrade, unit Contract prices shall apply, unless the Work and/or the equipment to perform the Work differs materially from the excavation above Subgrade, then payment will be in accordance with Section 1-04.4.

"Unsuitable Foundation Excavation", per cubic yard.

"Unsuitable Foundation Excavation Incl. Haul", per cubic yard.

The unit Contract price per cubic yard for "Unsuitable Foundation Excavation" and "Unsuitable Foundation Excavation Incl. Haul" shall be full payment for all costs incurred for excavating, loading, and disposing of the material. For "Haul", the unit Contract price as provided in Section 2-04 shall apply, except when the Bid item is shown as including Haul. In that case, the unit Contract price per cubic yard shall include "Haul."

"Common Borrow Incl. Haul", per cubic yard.

The unit Contract price per cubic yard for "Common Borrow Incl. Haul" shall be full compensation for all costs incurred for excavating, loading, hauling, placing, or otherwise disposing of the material. The unit Contract price includes removing, disposing of, wasting, or stockpiling any material in the borrow site that does not meet the Specifications for "Common Borrow".

"Select Borrow Incl. Haul", per ton.

"Select Borrow Incl. Haul", per cubic yard.

"Gravel Borrow Incl. Haul", per ton.

"Gravel Borrow Incl. Haul", per cubic yard.

"Sand Drainage Blanket", per ton.

The unit Contract price per ton or cubic yard for "Select Borrow Incl. Haul", "Gravel Borrow Incl. Haul" and "Sand Drainage Blanket" shall be full compensation for all costs incurred for excavating, loading, hauling, and placing the material unless otherwise specified in the Proposal.

"Embankment Compaction", per cubic yard.

The unit Contract price per cubic yard for "Embankment Compaction" shall be full compensation for all costs incurred for all material, labor, tools, equipment, and incidentals required.

When embankments are constructed using Method A compaction, payment for embankment compaction will not be made as a separate item. All costs for embankment compaction shall be included in other Bid items involved.

If the Bid item "Embankment Compaction" is not provided in the Proposal, compensation for costs incurred to perform the Work described in Section 2-03.3(14), Embankment Construction, shall be included in payment for other items of Work in the Contract.

"Aeration", by force account.

"Aeration" will be paid for by force account as specified in Section 1-09.6. The payment for aeration and other related unit Contract prices shall be full compensation for all costs incurred to perform the Work described in Section 2-03.3(15). Should the Contractor fail to seal an aerated area prior to inclement weather, additional aeration to restore the area to its previous condition shall be at the Contractor's expense.

For the purpose of providing a common Proposal for all Bidders, the Contracting Agency has entered an amount in the Proposal to become a part of the total Bid by the Contractor.

"Controlled Blasting of Rock Face", per linear foot.

The unit Contract price per linear foot for "Controlled Blasting of Rock Face" shall be full compensation for all costs incurred to perform the Work described in Section 2-03.3(2). Measurement and payment for Roadway excavation and haul related to blasting shall be as provided under those items in this section and shall include the volume of material excavated from the benches or setbacks approved for drilling separate lifts.

"Prefabricated Vertical Drain", per linear foot.

The unit Contract price per linear foot shall be full compensation for all costs incurred to perform the Work, including trial drains, as described in Section 2-03.3(14)H.